Having thus described the invention, we claim:

1. A reduced carbon dioxide emissions method for providing power for refrigerant compression and shared electrical power for a light hydrocarbon gas liquefaction process, the method comprising:

a) cooling an air stream to a temperature below about 20°C to produce a cooled air stream;

b) supplying a cooled inlet air stream to at least one light hydrocarbon gas-fired turbine;

c) compressing a refrigerant in a plurality of compressors driven by a plurality of light hydrocarbon gas-fired turbines fueled by the cooled inlet air stream and a fuel gas stream with the turbines producing an exhaust stream at an elevated temperature;

d) producing steam at an elevated temperature and pressure by heat exchange with the exhaust stream;

e) driving a steam turbine with the steam from d) to produce mechanical power; and

f) driving an electrical power generator with the mechanical power from e) to produce electrical power for use in the light hydrocarbon gas liquefaction process.

2. The method of claim 1 wherein the air stream is cooled by a common cooler for at least a major portion of the turbines.

3. The method of claim 1 wherein the air is cooled to a temperature from about 8 to about 15°C.

4. The method of claim 2 wherein the common cooler cools the air by heat exchange with a fluid or surface which are operated independently from the light hydrocarbon gas liquefaction process and the light hydrocarbon gas liquefaction process refrigerant.

5. The method of claim 1 wherein the cooled inlet air is compressed and combined with a fuel gas for combustion to fuel the plurality of turbines.

6. The method of claim 1 wherein carbon dioxide emissions from the light hydrocarbon gas liquefaction process are reduced by up to about sixty percent by comparison to a comparable process wherein no air cooling is used, no heat recovery from the exhaust gas stream is used, electrical power produced by fossil fuel combustion is used as the primary source of electrical power for the light hydrocarbon gas liquefaction process.

7. The method of claim 1 wherein the light hydrocarbon gas is natural gas.

8. The method of claim 7 wherein at least a portion of hydrocarbon gases heavier than about C_3 and at least a portion of acid gases are removed from the natural gas.

9. The method of claim 1 wherein the air stream is cooled by a propane or a water/glycol cooler.

10. A reduced carbon dioxide emissions method for providing compressed refrigerant compression and shared electrical power to a light hydrocarbon gas liquefaction process, the method consisting essentially of:

a) cooling an air stream to a temperature below about 20°C to produce a cooled air stream;

b) supplying a cooled inlet air stream to at least one light hydrocarbon gas-fired turbine;

c) compressing a refrigerant in a plurality of compressors driven by a plurality of light hydrocarbon gas-fired turbines fueled by the cooled inlet air stream and a fuel gas stream with the turbine producing an exhaust stream at an elevated temperature;

d) producing steam at an elevated temperature and pressure by heat exchange with the exhaust stream; and,

e) driving a steam turbine with the steam from d) to produce mechanical power; and

f) driving an electrical power generator with the mechanical power from e) to produce electrical power for use in the light hydrocarbon gas liquefaction process.

11. A reduced carbon dioxide emissions system for providing power for refrigerant compression and shared electrical power for a light hydrocarbon gas liquefaction process, the system comprising:

a) an air cooler having an air inlet and at least one cooled air outlet;

b) a light hydrocarbon gas-fired turbine comprising an air compressor having an air inlet in fluid communication with a cooled air outlet from the air cooler and a compressed air outlet in fluid communication with a combustion zone having a fuel inlet and a high-temperature, high-pressure combustion gas outlet in fluid communication with a combustion gas inlet to the turbine to drive the turbine, the turbine having a reduced pressure, high-temperature exhaust gas outlet;

c) a refrigerant compressor driven by the turbine and having a low-pressure refrigerant inlet and an increased pressure refrigerant outlet with the compressor being shaft coupled to the turbine;

d) a heat exchanger having a water or low-pressure stream inlet and a steam outlet and a high-temperature reduced pressure exhaust gas inlet in fluid communication with the reduced pressure, high-temperature exhaust gas outlet and a reduced pressure reduced temperature exhaust gas outlet so that the reduced pressure, high-temperature exhaust gas passes in heat exchange with the water or low-pressure steam to produce high-pressure steam and a reduced pressure, reduced temperature exhaust stream;

e) a steam turbine in fluid communication with the steam outlet of the heat exchanger;

f) an electrical power generator which is shaft coupled to the steam turbine such that mechanical power produced by the steam turbine is used to drive the electrical power generator and produce electrical power; and

g) a line in fluid communication with the increased pressure refrigerant outlet and the light hydrocarbon gas liquefaction process.

12. The system of claim 11 wherein the air compressor is an axial air compressor or a centrifugal air compressor.

13. The system of claim 12 wherein air compressor is a multi-stage axial compressor or a multi-stage centrifugal air compressor.

14. The system of claim 11 wherein carbon dioxide emissions from the light hydrocarbon gas liquefaction process are reduced by up to about sixty percent by comparison to a comparable process wherein no air cooling is used, the exhaust gas stream is discharged or used for other purposes and electricity produced by fossil fuel combustion is used as the primary source of electricity for the light hydrocarbon gas liquefaction process.

15. The system of claim 11 wherein the air cooler is a propane or a water/glycol air cooler.

16. The system of claim 11 wherein each of a plurality of turbines are in fluid communication with a cooled air outlet from the air cooler.

17. The system of claim 11 wherein the water or low-pressure steam and reduced pressure, high-temperature exhaust gas are passed in counter current heat exchange.

18. The system of claim 11 wherein low-pressure refrigerant is passed from the light hydrocarbon gas liquefaction process to the low-pressure refrigerant inlet.

19. The system of claim 18 wherein the electrical power is passed to the electrical supply grid for the light hydrocarbon gas liquefaction process.

20. The system of claim 11 wherein the turbines may produce compressed refrigerant at different selected pressures.